

IMAZAPYR-FIRE INTERACTIONS FOR BOBWHITE QUAIL HABITAT ENHANCEMENT

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ABSTRACT

During the last 30 years, northern bobwhite quail (*Colinus virginianus*) populations in the southern United States have plummeted. From 1966–1995, quail populations in Mississippi, Alabama, Georgia, and Florida declined annually by 3.5%, 3.7%, 3.9%, and 2.7%, respectively. The decline accelerated from 1980–1995, with average annual declines of 4.4%, 6.3%, 4.6%, and 4.7% for those states, respectively. The annual decline across the United States averaged 2.4% from 1966–1995, with an increase in the average decline to 3.0% for 1980–1995. Some of the many reasons for the decline are: (1) marginal cropland conversion to fescue (*Festuca* spp.), bahiagrass (*Paspalum notatum*), and bermudagrass (*Cynodon dactylon*) under the Conservation Reserve Program, (2) more efficient agricultural practices on intensely managed farms, (3) agricultural conversion to forestland, (4) reduction in the use of prescribed fire, (5) mortality induced by fire ants, predation, forest fragmentation, conversion of mixed pine-hardwood stands to predominantly pine, and invasion of low-quality hardwood brush in many forested sites. Habitat changes seem to account for most of the declines.

Imazapyr, one of the imidazolinone herbicides, was introduced to forest managers in 1986 and has become the dominant herbicide used for silvicultural applications in the South. Uses include site preparation, herbaceous weed control, conifer release, mid- and late-rotation release, improving forest aesthetics, and wildlife habitat enhancement. It is especially well suited for bobwhite quail habitat management since legumes (e.g., lespedeza [*Lespedeza* spp.], partridge pea [*Cassia fasciculata*], and beggarweeds [*Desmodium illinoense*]) and *Rubus* species (blackberry and dewberry) are tolerant and recolonize areas after treatment as they are released. Other plant species that recolonize treated sites can include ragweed (*Ambrosia* spp.), goldenrod (*Solidago* spp.), pokeweed (*Phytolacca americana*), milkweed (*Asclepias* spp.), panicum grasses (*Panicum* spp.), and other early pioneer successional species. In areas dominated by mature longleaf pine (*Pinus palustris*) and loblolly pine (*Pinus taeda*) where low-quality hardwood brush has been controlled by imazapyr followed by a prescribed burn, native quail populations have increased up to tenfold in the last 6 years. An increase in forbs, legumes, and *Rubus* species occurred. Greater average seed weight in legumes has been documented, as well as an increase in the protein content of seeds. Because of an increase in flowering plants, insects have been shown to be more abundant after applications for much of the growing season. The reduction in the basal area of low-quality hardwoods in the understory followed by a prescribed burn has resulted in up to 33-fold increases in forbs.

Mechanical treatments have long been used as bobwhite quail habitat management tools, especially roll drum chopping and brush hogging. Neither treatment adequately controls hardwood rootstocks and may actually increase the number of low-quality hardwood stems due to prolific sprouting. A new mechanical device, called a Maddron drag, when used in combination with an imazapyr application, has been recently tested. Maddron drags consist of old crawler tractor tracts. Advantages noted include nearly permanent hardwood control, exposure of bare mineral soil, and the recolonization of legumes, *Rubus* species, flowering plants, and forbs. The treatment smoothes out the soil and allows for easier walking for hunters. It can be less expensive and more productive than other mechanical methods.

Bobwhite quail toxicology testing has also been conducted. Oral LD50 (lethal dose that kills 50% of the population) values of >2,150 milligrams per kilogram body weight and 8-day dietary LC50 (lethal concentration that kills 50% of the population) values of >5,000 parts per million were determined. In 18-week toxicity and reproduction studies, no treatment-related signs of systemic toxicity and no adverse effects upon reproductive performance and egg production, egg thickness, and egg quality and hatchability were found at dietary levels of $\leq 2,000$ parts per million, the highest dose tested. No mutagenic effects, teratogenic effects, or fetotoxic effects were observed. Environmental fate studies have also been conducted. The calculated half-life of imazapyr in forest soil ranged from 19–34 days. Half-life of imazapyr in plant and pine tissue ranged from 12–40 days. Half-life in leaf litter ranged from 37–44 days.

Control of low-quality understory hardwoods and other uses of imazapyr for bobwhite quail habitat management enhance preferred food plants, increase access for wildlife management activities, enhance hunter visibility and safety, improve forest aesthetics, and increase wood production. Such uses of imazapyr also can increase plant biodiversity, reduce the accumulation of fuel and reduce the intensity and frequency of prescribed fire, and increase the carrying capacity of bobwhite quail.

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